 0030-0950/78/0006-0304$1.50/0

LIFE HISTORY OF *ACROPTEROXYS GRACILIS* (COLEOPTERA: LANGURIIDAE) ON COMMON RAGWEED IN NORTHEASTERN OHIO[1, 2]

GARY L. PIPER,[3] Department of Entomology, Texas A&M University, College Station, TX 77843

Abstract. The life cycle of *Acropteroxys gracilis* (Newman), a languriid associate of common ragweed, *Ambrosia artemisiifolia* L., was studied. Adults began appearing in late May and were most abundant during mid-June. A single egg was deposited per stem, usually in the basal third of the stem and the larva tunneled and fed upon the pith. The fully-grown larva overwintered in a state of temperature-induced quiescence within the stem. Pupation usually occurred during early May in the excavated stem. The beetle is univoltine in northeastern Ohio. The egg, larvae, and pupa of *A. gracilis* are described and/or illustrated for the first time.

OHIO J. SCI. 78(6): 304, 1978

The entomofaunas of many important North American weeds have been inadequately investigated, including those of common ragweed, *Ambrosia artemisiifolia* L. (Compositae), a serious agricultural pest and well-known aeroallergenic pollen-producer responsible for late summer and fall hayfever throughout much of the United States (Natl. Acad. Sci. 1968, Wodehouse 1971). In northeastern Ohio, ragweed is attacked by a diverse assemblage of phytophagous insects, including many Coleoptera whose biologies are poorly known. Piper (1975, 1977) has presented accounts of the bionomics of several *A. artemisiifolia* feeding beetles. The present paper describes the results of a study elucidating the life history of the languriid, *Acropteroxys gracilis* (Newman), a pith-feeding member of this beetle complex.

The genus *Acropteroxys* Gorham contains two Neotropical species, one Nearctic species, and one species which has both a Neotropical and Nearctic distribution (P. Vaurie, per. comm.). The two widely distributed North American species, *A. gracilis* and *A. lecontei* (Crotch), originally were placed in the languriid genus *Languria* Latreille but were subsequently transferred to the genus *Acropteroxys* by Schaeffer (1904). The adult taxonomy of the genus is relatively well understood, but information on the biologies and immature stages of all species is virtually nonexistent. Vaurie (1948) reviewed the genus in North America and provided adult descriptions, distributional, and host plant data. Chittenden (1890) reported the occurrence of *A. gracilis* larvae in stems of the composites *Ambrosia trifida* L. and *Erigeron* spp., and the nettle *Urtica dioica* L. Blatchley (1910) also noted the species on ragweed in Indiana.

MATERIALS AND METHODS

Field observations on the biology of *A. gracilis* were made in or near the city of Kent (Portage County) in northeastern Ohio. Adults either were collected individually in small vials or swept from ragweed plants by nets. Stems of the ragweed were dissected to obtain eggs, larvae, and pupae.

The laboratory rearing techniques employed were similar to those previously described by Piper (1975). All rearings were maintained at 20°–25°C, 50–60% relative humidity, and a 12 hr light: 12 hr dark regime.

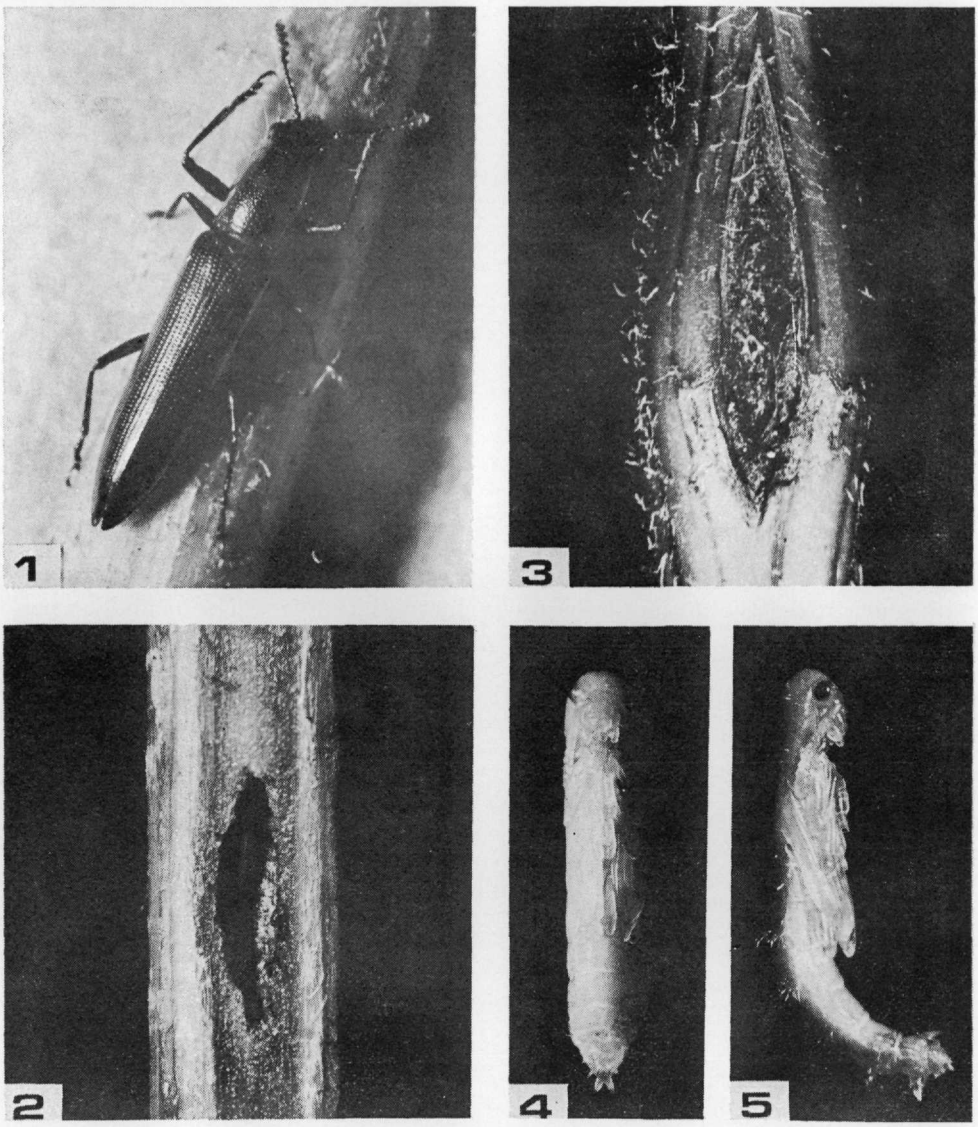
LIFE HISTORY

Acropteroxys gracilis is distributed from the Atlantic states, south to Louisiana, west to New Mexico, and north to Idaho (Vaurie 1948). Adults are slender, 8–10

[1]Manuscript received 27 June 1977 and in revised form 26 October 1977 (#77-49).

[2]Approved as Technical Article No. 13503, Texas Agric. Exp. Stn. Series.

[3]Present Address: Department of Entomology, Washington State Univ., Pullman, WA 99163.



FIGURES 1–5. *Acropteroxys gracilis*. 1. Adult 2. Stem cut away to reveal egg in pith 3. Oviposition scar on stem 4. Pupa, ventral view 5. Pupa, lateral view.

mm long, and characterized by a red head, red pronotum with a black longitudinal discal macula and black elytra (fig. 1).

Adults began emerging in late May and were taken throughout June and July. Peak populations were found 2–3 weeks after the first emergence. Field-collected adults lived from 17–25 days; laboratory-reared adults lived from 22–48 days, with the females generally outliving the males. There was only 1 generation per year in northeastern Ohio.

Adults of both sexes fed upon ragweed leaf petioles, leaves, and stems. Feeding activity was most pronounced during the morning and evening hours. During the heat of the day, the beetles were relatively inactive, usually resting head downward on the lower shaded portion of

the stem. Adults are thanatotropic and drop from the plant immediately when approached or physically disturbed.

The premating period (from emergence to first copulation) averaged 6 (range 4–8) days. Mating was observed most frequently in nature during the evening on the stem of the host plant. The male approached the female from behind, mounted her dorsum, and quickly moved forward and backward along the length of her body several times. Immediately pursuant this precopulatory behavior, the male grasped either the genae or propleura of the female with his forelegs, and either her abdominal sternites or hind coxae with his middle pair of legs. His hindlegs embraced the stem. The male then directed his extruded aedeagus downward and coupled with the female's genitalia. While in copula, a male often palpated the pronotum and stroked the genae of the female with his foretarsi.

On one occasion, a male attempted to mount a female in copula, forcing the copulating male off her dorsum. The disengaged male faced and repeatedly attacked the interloper until he was driven off the plant. The victorious male returned to the female and resumed copulatory activity. Copulation lasted from 2–60 min. Disengagement and reengagement occurred several times during mating but the male did not dismount until mating was completed. Mating occurred repeatedly prior to egg deposition, but declined in frequency thereafter.

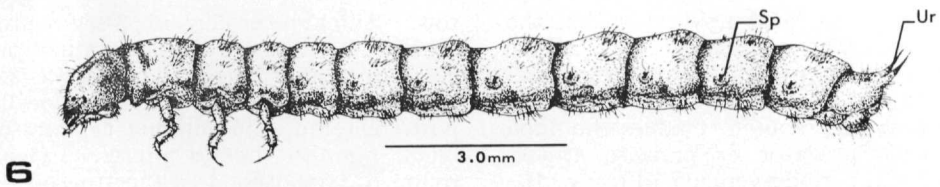
The preoviposition period was not determined. Daily egg production of 10 females ranged from 1–3 per female, with an average of 1 per day. Total egg production per female ranged from 10–15, the average being 12. The length of the oviposition period varied from 10–18 days with an average length of 14 days.

An *A. gracilis* female typically selected a 46–61 cm tall ragweed plant with a stem diameter of ca. 5 mm for egg-laying. Upon locating a suitable stem, a female positioned her body parallel to the stem with the head directed upward and began to prepare the oviposition hole on the basal third of the stem. She first gnawed a fusiform slit through the epidermal and cortical tissues and then proceeded to excavate a smaller hole near the mid-point of the slit. She introduced her head and thorax into the hole and hollowed out an elliptical cavity in the pith. After preparing the cavity, the female advanced up the stem until the tip of her abdomen was positioned above the excavation. She probed for the aperature and, upon its location, inserted the abdomen and attached an egg to the opposite stem wall (fig. 2). There usually was only 1 egg deposited per cavity, but on several occasions 2 eggs were found. Immediately after ovipositing, the female used her mandibles to tease out the stem tissue bordering the hole leading into the pith, thus concealing the egg within. Recent oviposition punctures were white but turned dark brown after several days. The stem also became distended at the point of oviposition (fig. 3). Eggs were found in the field from mid-June to late July. The incubation period of 20 eggs held under laboratory conditions was 5 days.

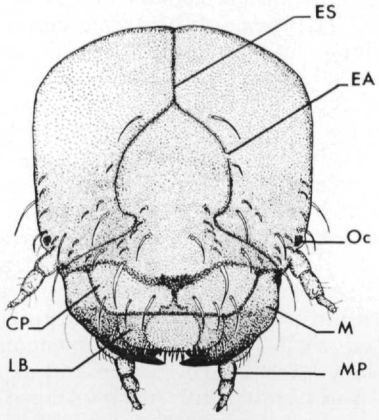
Upon hatching, the first instar fed upon the decaying tissue within the oviposition cavity for several days before boring into the pith. The second, third, and fourth instars tunneled the stem and consumed almost all of the pith. The linear gallery thus formed ranged from 30–55 cm in length. When disturbed, a larva sought refuge in the lower portion of its burrow. Only a single larva per stem was found. The first stadium was completed in 6–11 days, the second in 7–12 days, the third in 10–12 days, and the fourth, under laboratory conditions only, in 14–16 days. In some plants examined, extensive larval damage had weakened the stems and rendered them susceptible to breakage by strong winds. Heavy feeding also appeared to retard seed production.

During late September and October, a fourth instar constructed a pupal cell within the basal section of the mined stem. The cell, which measured 20–41 cm in length, was sealed with an upper and a lower plug of fecula and frass. The fully-grown larva overwintered in a state of temperature-controlled quiescence within this chamber.

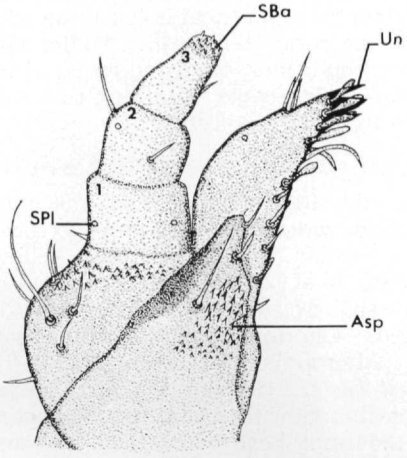
Pupation occurred during late April and early May. In nature, a larva al-



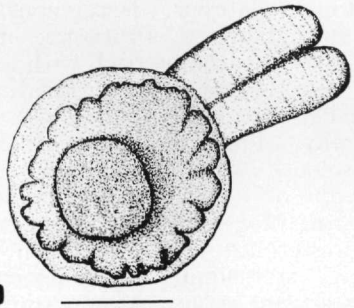
6



7

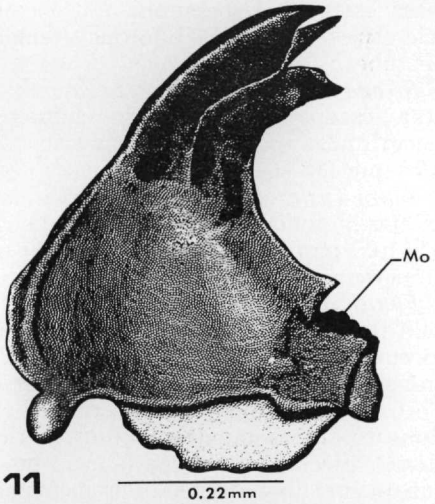


8



9

10



11

FIGURES 6–11. *Acropteroxys gracilis*. 6. Lateral habitus of fourth instar 7. Head capsule of fourth instar, frontal view 8. Right maxilla of fourth instar, ventral view 9. Abdominal spiracle of fourth instar 10. Egg 11. Right mandible of fourth instar, ventral view. Asp=asperities, CP=clypeus, EA=epicranial arm, ES=epicranial suture, LB=labrum, M=mandible, Mo=mola, Mp=micropyle, MP=maxillary palpus, Oc=ocellus, SBa=sensillum basiconicum, Sp=spiracle, SPl=sensillum placodeum, Un=uncus, Ur=urogomphi.

ways pupated head upward within the chamber. The pupa was very active and capable of rapidly ascending and descending its chamber. In is most probable that this mobility enables the pupa to evade predator or parasite attack. The pupal period averaged 13 (range 10–14) days. The adult languriid escaped from the confines of the pupal chamber by chewing a cylindrical hole through the fragile, necrotic stem wall. Under laboratory conditions, the time required for a complete life cycle, from egg to adult, varied from 57–64 days.

DESCRIPTION OF IMMATURE STAGES

Egg (fig. 10). Length 1.71–1.98 mm, maximum width 0.46–0.49 mm (20 specimens). Color translucent pale yellow. Elongate oval, dorsal and ventral surfaces slightly curved, ends bluntly pointed. Chorion smooth, without pattern. Micropyle located terminally.

First Instar. Similar to fourth instar except in following characters. Length 1.98–2.44 mm, head width 0.43–0.53 mm (15 specimens). Color translucent yellow. All cephalic, thoracic, and abdominal setae longer in proportion to those of later instars. Urogomphi not heavily sclerotized. Spiracles biforous; crenulate air tubes.

Second Instar. Similar to fourth inatar except in following characters. Length 4.34–6.30 mm, head width 0.70–0.73 mm (15 specimens).

Third Instar. Similar to fourth instar except in following characters. Length 9.8–10.5 mm, head width 0.93–0.99 mm (15 specimens).

Fourth Instar (fig. 6). Length 12.6–14.0 mm, head width 1.12–1.44 mm (15 specimens). Color pale yellow to dark orange, shining; integument thin; sparsely clothed with fine white setae. Form elongate, orthosomatic; sub-cylindrical. Head exserted, prognathous; broad, dorso-ventrally flattened. Distinct spade-shaped epicranial suture (fig. 7); epicranial arms curving ventral to antennal sockets. Frons with 18 setae; longitudinal row of 4 short setae laterad basal indentation of each epicranial arm, curved transverse row of 4 long and 4 short setae dorsad clypeus, and a pair of widely spaced long setae ventrad the transverse row. Antennae prominent; 3-segmented, segment 2 bearing a supplementary process; segment 2 longer than 1 or 3; segment 3 slender and tapered. One ocellus posterolaterad each antenna; lens raised; black pigment bodies present. Genae rounded, smooth: 4 setae present, 1 dorsad, 1 laterad, and 2 ventrad each ocellus. Frontoclypeal suture not well-defined. Clypeus with a transverse row of 6 long setae. Clypeal-labral suture present. Labrum twice as long as wide; row of 8 setae on dorsal half; rounded anteriorly, densely setiferous. Mandibles (fig. 11) blackened and tridentate apically; mola distinct; ectal surface bearing 2 setae. Maxillary palpi (fig. 8) 3-segmented; segment 3 longer than segments 1 or 2. Ventral surface of segment 1 with 2 sensilla placodea; segment 2 with 1 sensillum placodeum; tip of segment 3 invested with 11–12 sensilla basiconica. Maxillary lobes bearing setae and asperities. Mala falciform with sclerotized unci. Labial palpi 2-segmented; segment 2 longer than segment 1; tip of segment 2 with 11–12 sensilla basiconica. Ligula, mentum, and submentum setose. Hypostoma glabrous, ferruginous sutures; gula glabrous. Prothorax, mesothorax, and metathorax each with a pair of legs; legs 4-segmented, terminating in sclerotized tarsunguli; legs setose ventrolaterally. Pronotum somewhat darkened, smooth, shining; anterior dorsolateral row of 10 setae, posterior dorsolateral row of 8–10 setae. Prosternum with presternum and eusternum protuberant; sternellum and presternum bearing several setae. Mesonotum and metanotum each with a transverse row of 8–10 setae; mesosternum and metasternum shining; eusternum of each with a medium group of 3–5 setae. Abdominal segments 1–8 elongate; each tergum bearing an anterior dorsolateral row of 6 setae and a posterior dorsolateral row of approximately 30 setae; sterna with anterior and posterior transverse rows of setae. Epipleuron indistinct; pleural tubercles on segments 1–8, each with 3 setae. Segment 9 short, heavily setose; a pair of pointed, sclerotized urogomphi (fig. 6) adjacent to meson project dorsocephalad. Segment 10 rounded with a row of 12 long setae dorsad pseudopod;

pseudopod bordered by numerous setae. Spiracles small, annular-biforous, air tubes annulate; peritremes feebly sclerotized (fig. 9). Paired spiracles located on mesothorax, metathorax, and abdominal segments 1–8; mesothoracic spiracle largest; metathoracic spiracle vestigial, nonfunctional.

Pupa (figs. 4 and 5). Length 9.0–13.2 mm (15 specimens). Body closely resembling form of adult in size, shape, and in proportions of cephalic and thoracic appendages; exarate; color pale pink to dark orange. Head with vertex visible from above, vertex smooth, lightly setose; dense clusters of setae bordering eyes and rims of antennal sockets. Clypeus with 6 setae. Labrum with 4–6 setae. Antennae arising ventrad ocelli, slightly curved, and directed posterolaterally, terminating alongside the front femora. Eyes convex, glabrous. Mandibles with 2 fine setae near middle of ectal surface. Anterior and posterior margins of pronotum each with a transverse row of long, fine setae; lateral margins of pronotum with a row of long setae. Mesonotum with 2 groups of 5–6 setae near each wing base; scutellum protuberant, glabrous. Anterior margin of mesopleuron with a large, oval spiracle. Metanotum smooth except near the scutellar groove where it is transversely striate. Elytra and wings hyaline, extending to abdominal segment 4. Abdominal terga 1–7 protuberant; terga 3–8 each with an elevated, transverse row of chitinized spines each bearing a basal seta. Tergite 7 tapered slightly with a bifurcated protuberance armed with 4 stout spines. Tergite 8 short; transverse row of 4 spines. Tergite 9 short, bearing a pair of divergent, curved urogomphi. Sternites glabrous except for a transverse row of fine setae along the posterior margin. Sternite 7 with a bifurcated protuberance, each fork with 2 sclerotized spines. Sternite 8 setose. Legs with 6 setae near apex of each femur and near mid-point of each tibia; hind femora extending to abdominal segment 2; tibiae and tarsi directed posterad. Spiracles present on abdominal segments 1–8; oval, peritremes slightly elevated above general level of cuticle; nonsclerotized.

LITERATURE CITED

Blatchley, W. S. 1910 An illustrated descriptive catalog of the Coleoptera or beetles known to occur in Indiana. Nature Publ. Co., Indianapolis. 1346 pp.

Chittenden, F. H. 1890 Notes on *Languria*. Insect Life 2: 346–347.

National Academy of Sciences 1968 Weed Control. Publ. 1597. Washington, D.C. 471 pp.

Piper, G. L. 1975 The biology and immature stages of *Zygogramma suturalis* (Fabricius) (Coleoptera: Chrysomelidae). Ohio J. Sci. 75: 19–24.

——— 1977 Biology and immature stages of *Cylindrocopturus quercus* (Say) (Coleoptera: Curculionidae). Coleopt. Bull. 31: 65–72.

Schaeffer, C. 1904 New genera and species of Coleoptera. J. New York Entomol. Soc. 12: 197–236.

Vaurie, P. 1948 A review of the North American Languriidae. Amer. Mus. Nat. Hist. Bull. 92: 123–155.

Wodehouse, R. P. 1971 Hayfever plants. 2nd ed. Hafner Publ. Co., New York 280 pp.